

Items 3 & 4: Citations from the ABSTRACTs:

5,848,767 to Cappa et al. discloses "A single piece frame for a spacecraft, the frame manufactured as fiber composite sheets overlaying a core. The core is preferably made of aluminum and formed with a honeycomb cross-section. The frame provides a mounting structure to which payload, spacecraft equipment, and boost vehicle are attached. The frame can be reinforced locally by varying the core density or the wall thickness so as to resist concentrated or localized loads. The orientation of the fiber in the composite sheets may also be varied so as to strengthen the frame in a desired location."

5,747,721 to Speakes et al. discloses "A ballistic shield for mounting to an aircraft fuselage which is formed of lightweight, composite, material and shaped to conform to the shape of the fuselage belly that when mounted creates a space between the shield and the belly to enable energy-absorbing deflection of the shield. Compartments formed in the shield midsection receive removable inserts that can be constructed of different ballistic-resistant materials to enable field modification of the shield to meet a perceived threat level."

5,686,689 to Snedeker et al. discloses "A lightweight composite armor including an integrally formed matrix block... . The matrix block includes a generally planar back, a plurality of intersecting ridges extending from the front of the planar back, and fillets provided at the junctures between the planar back and the ridges and at the juncture between the ridges. The matrix block thus forms a pattern of open topped cells... ."

5,624,088 to Fiore discloses a "Spacecraft structure for use in the construction of the outer wall of a spacecraft. The construction of the outer wall ... includes a hollow cellular honeycomb material that is sandwiched between a thin outer curved solid panel and a thin solid inner panel that has at least a portion that has a substantially flat inner surface... ."

5,601,258 to McClymonds discloses "A shield for protecting spacecraft from impact with particles having a wide range of velocities includes three elements. Sets of spacers are used to secure the elements in positions in which they are separated from each other selected distances. The bumper element is the outermost element and is composed of ceramic fabric material or tin and is utilized to vaporize or melt a high velocity particle upon impact therewith. The intermediate element is a cloud stopper element and is composed of a metallic layer over a graphite epoxy layer and is used to absorb small fragments resulting from high velocity impacts with the bumper element. The innermost element is a fragment stopper element and is utilized to absorb low velocity particles.."

5,443,884 to Lusignea et al. discloses "Film-based composite structures [that] meet the requirements of highly weight-efficient SDI space-based systems. These structures are rigid, lightweight, dimensionally stable, and possess a high degree of structural damping. Thin-walled structures ... made from self-reinforced ordered-polymer films overcome drawbacks of fiber-reinforced composites, and provide resistance to microcracking, ply delamination and impact... ."

5,221,807 to Vives discloses "The armor for providing ballistic protection [which] comprises an armor plate for stopping projectiles with an auxiliary plate disposed in front thereof at a determined spacing therefrom, the auxiliary plate being constituted by a ceramic plate pierced by a large number of cells distributed in a regular mesh and constituted by blind holes extending perpendicularly to the rear face of the auxiliary plate and opening out into the front face thereof. The effect of the auxiliary plate is to destabilize and to score the projectiles so as to enhance their tendency to shatter on striking the armor plate."

5,161,756 to Redmon, et al. discloses "A thermally isolated deployable shield for spacecraft which is provided utilizing a plurality of lattice panels stowable generally against the craft and deployable to some fixed distance from the craft. The lattice panels are formed from replaceable shield panels affixed to lattice structures. The lattice panels generally encircle the craft providing 360 degree coverage therearound. Actuation devices are provided for translating the shield radially outward from the craft and thermally isolating the shield from the craft. The lattice panels are relatively flexible, allowing the shield to deploy to variable diameters while retaining uniform curvature thereof. Restraining devices are provided for holding the shield relatively tight in its stowed configuration. Close-out assemblies provide light sealing and protection of the annular spaces between the deployed shield and the crafts end structure."

5,102,723 to Pepin discloses "A lightweight hybrid structural energy-absorbing panel having a plurality of layers of soft energy-absorbing material, such as Kevlar, disposed between facesheets with a plurality of rigid rod members extending between the facesheets through the layers of energy-absorbing material to structurally connect the face-sheets, such panel to absorb the energy of ballistic projectiles."

5,067,388 to Crews et al. (Assignee: NASA) discloses "A hypervelocity impact shield and method for protecting a wall structure, such as a spacecraft wall from impact The shield comprises a stack of ultra thin sheets of impactor disrupting material supported and arranged by support means in spaced relationship to one another and mounted to cover the wall in a position for intercepting the particles. The sheets are of a number and spacing such that are impacting particle and the resulting particulates of the impacting particle and sheet material are successively impact-shocked to a thermal state of total melt and/or vaporization to a degree as precludes perforation of the wall... ."